BITCOIN IN MULTI-ASSET PORTFOLIOS

ADDING BITCOIN TO A GLOBAL 60/40 PORTFOLIO CAN IMPROVE THE RISK-RETURN PROFILE

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KEY HIGHLIGHTS:

+ Bitcoin is a unique asset in its infancy. It exhibits extraordinary levels of return, as well as risk, however it remains to be seen how the asset will mature. Its behaviour over the past few years sheds a valuable light on what one might expect in the coming years.
+ The asset class is prone to massive price swings than can appear daunting to an investor. A systematic approach to investing in Bitcoin via systematic profit-taking can help to prevent behavioural pitfalls.
+ Examining the role of Bitcoin in the portfolio can generate surprising results. Even very small allocation in a portfolio can potentially enhance returns quite significantly with a more limited increase in overall risk, granting the portfolio a better risk/return profile.

Bitcoin has increasingly been drawing attention from the investment community over the past few years. While the cryptocurrency has successfully bagged illustrious headlines such as "best-performing asset of the year", those have often been followed by major downturns in a short span of time. Interestingly, it also shows a low correlation to other asset classes, which justifies an evaluation of its potential role within an investment portfolio.

In the following analysis, we look at how small levels of Bitcoin allocation can impact a portfolio's characteristics.

WHAT ARE THE PORTFOLIO RULES?

***** Please note: all portfolios are hypothetical and for illustrative purposes only. *****

We'll be looking at an example of a simple constant mix strategy, rebalancing quarterly.

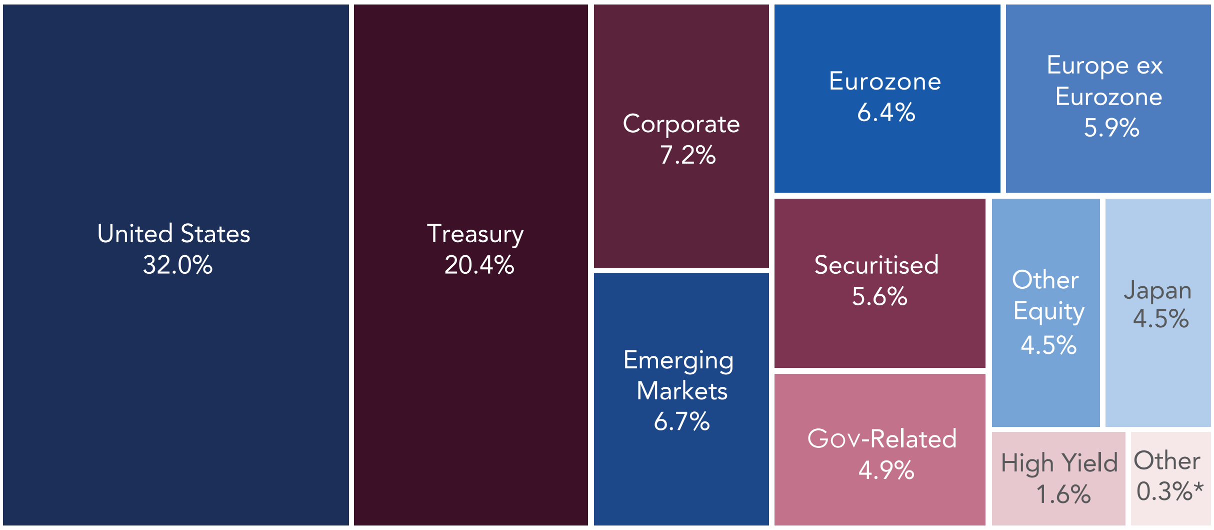
The strategy backtest starts on the last business day of 2013. You can find explanations on that choice in the Appendix.

The base portfolio (**Base Portfolio**) that we consider here is a **40%** Global Bonds (including High Yield), represented by the Bloomberg Barclays Multiverse Total Return Index, and **60%** Global Equities (including Emerging Markets), represented by the MSCI ACWI Net Total Return Index.

All computations are in **USD.**

Let's progressively add some allocation to Bitcoin (we'll call them **Bitcoin Portfolios**).

FIGURE 1: BASE PORTFOLIO ALLOCATION

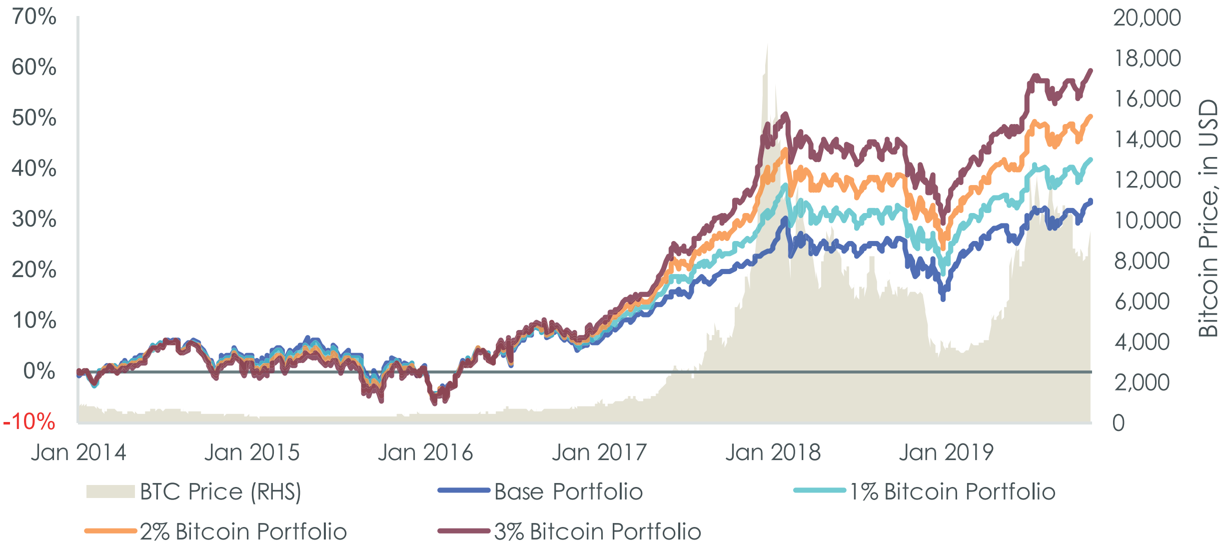


**Other stands for Other Fixed Income*

Source: WisdomTree, Bloomberg. As of 31 October 2019. ***You cannot invest directly in an index. May include backtested data. Historical performance is not an indication of future performance and any investments may go down in value.***

PORTFOLIOS RISK / RETURN PROFILE

FIGURE 2: BITCOIN ALLOCATION IMPROVED PORTFOLIO PERFORMANCE



Source: WisdomTree, Bloomberg. From 31 December 2013 to 31 October 2019. ***You cannot invest directly in an index. May include backtested data. Historical performance is not an indication of future performance and any investments may go down in value.***

Figure 2 shows the cumulative performance of the Base Portfolio, as well as the three Bitcoin Portfolios in which 1 to 3% of the allocation has been moved from the equity portion of the portfolio to Bitcoin.

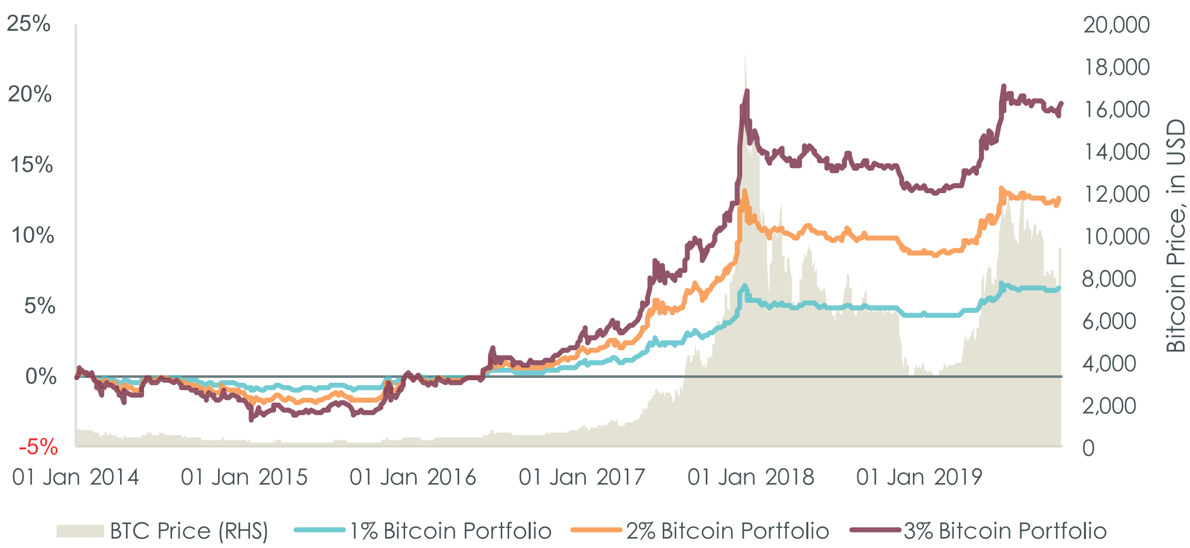
Unsurprisingly, the higher the allocation to the cryptocurrency, the higher the return. Nothing ground-breaking here when we know the performance generated by the asset class over that period. However, we can draw some interesting insights from the analysis:

- Even a small 1% allocation led to an 8.3% outperformance vs. the Base Portfolio.
- The underperformance of the Bitcoin Portfolios seems to be quite contained during the two Crypto Winters.[1]
- If investors had invested at the peak at the end of 2017, they would still experience a positive return on their Bitcoin Portfolios, which may seem counter-intuitive given the extent of the subsequent fall in cryptocurrency markets.

Looking at relative value helps get a better understanding of the phases of out/underperformance of an investment vs. another. It is computed as the ratio of an investment's dollar value over the dollar value of the second investment. Consequently, if the first investment increases at a faster pace than the second investment, i.e. if it outperforms the second investment, the ratio increases, and conversely. If they both perform in a similar fashion, the ratio will be flat.

We look in **Figure 3** at the relative value of the Bitcoin Portfolios vs. the Base Portfolio. A decreasing line indicates underperformance, while an increasing line indicates outperformance. If the Bitcoin Portfolios naturally underperform during crypto bear markets, we still have confirmation here that the portfolio underperformance is contained compared to the price collapse experienced by Bitcoin in those periods.

FIGURE 3: BITCOIN PORTFOLIOS UNDERPERFORMANCE CONTAINED IN CRYPTO CRASHES



Relative value versus the Base Portfolio.

Source: WisdomTree, Bloomberg. From 31 December 2013 to 31 October 2019. ***You cannot invest directly in an index. May include backtested data. Historical performance is not an indication of future performance and any investments may go down in value.***

[1] Reference to prolonged bear markets, from the end of 2013 to the end of Q3 2015, and then from the beginning of 2018 to March 2019.

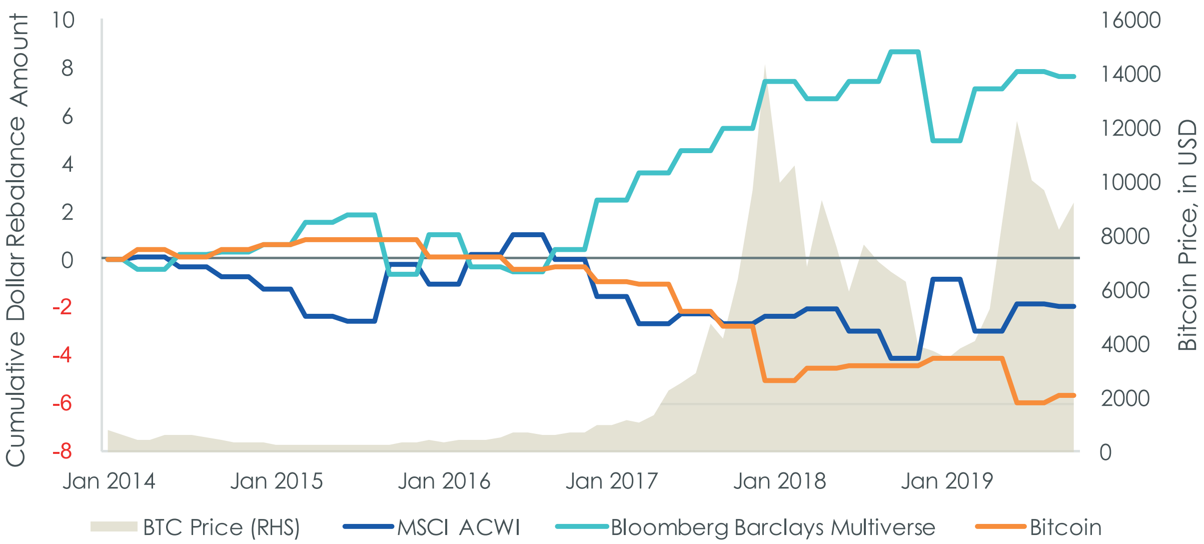
On the other hand, the outperformance in upside markets is quite significant. Given the historical speed and extent of upward movements in the Bitcoin price, the quarterly rebalance appears to allow for appreciation in the portfolio's crypto position, while regularly taking profits and reallocating those profits to the equity and fixed income portions.

Figure 4 shows the cumulative dollar amount rebalance to/from each of the three investments in the 1% Bitcoin Portfolio, assuming a $100 overall investment. When the orange line decreases, for example, it means that some of the Bitcoin position is sold and reallocated to other assets. You can observe that, at first, rebalances were reallocating from the equities portion of the portfolio to both the fixed income and Bitcoin portion. Indeed, equities were having a strong run, increasing their relative proportion in the portfolio, and needed to be sold to get back to the quarterly rebalance target weights.

But then, from the beginning of 2016 to the beginning of 2018, as Bitcoin was experiencing a sharp upswing, rebalancing was taking an increasing large amount out of the Bitcoin position, to transfer it to the fixed income portion, effectively taking large profits out of the Bitcoin position, and moving it to the low risk buckets of the portfolio.

Doing so is generally advantageous when markets are going sideways. Given that Bitcoin still exhibits a tendency to see its price multiplied over short periods of time followed by significant downturns, such a systematic profit taking methodology is potentially a good way to harness some excess return while avoiding some of the behavioural biases particularly exacerbated when it comes to investing in cryptocurrencies, such as regret aversion, anchoring, outcome bias and others.

FIGURE 4: REBALANCING TO SYSTEMATICALLY TAKE PROFIT



Example with the 1% Bitcoin Portfolio.

Source: WisdomTree, Bloomberg. From 31 December 2013 to 31 October 2019. ***You cannot invest directly in an index. May include backtested data. Historical performance is not an indication of future performance and any investments may go down in value.***

Let's now turn to some performance and risk measures.

FIGURE 5: ADDING BITCOIN TO A PORTFOLIO SIGNIFICANTLY IMPROVED RISK-ADJUSTED PERFORMANCE

	Annualised Return				Volatility				
	1y	3y	5y	si	ytd	1y	3y	5y	si
Base Portfolio	11.7%	8.1%	5.3%	5.1%	6.0%	6.8%	7.2%	7.6%	7.4%
1% Bitcoin Portfolio	13.1%	10.1%	6.7%	6.2%	6.0%	6.8%	7.5%	7.9%	7.7%
2% Bitcoin Portfolio	14.5%	12.1%	8.1%	7.3%	6.2%	7.0%	8.0%	8.3%	8.0%
3% Bitcoin Portfolio	15.9%	14.0%	9.4%	8.3%	6.5%	7.3%	8.7%	8.8%	8.5%
MSCI ACWI	12.6%	11.3%	7.1%	6.8%	10.4%	11.7%	11.3%	11.7%	11.4%
Bloomberg Barclays Multiverse	9.5%	3.0%	2.3%	2.2%	3.2%	3.2%	4.2%	4.4%	4.4%
Bitcoin	45.8%	135.7%	93.1%	53.8%	75.6%	78.1%	101.1%	85.2%	84.2%

	Sharpe				Correlation			
	1y	3y	5y	si	1y	3y	5y	si
Base Portfolio	1.37	0.90	0.56	0.57	1	1	1	1
1% Bitcoin Portfolio	1.58	1.13	0.72	0.69	0.99	0.99	0.99	0.99
2% Bitcoin Portfolio	1.74	1.31	0.85	0.80	0.95	0.95	0.97	0.97
3% Bitcoin Portfolio	1.86	1.43	0.96	0.88	0.90	0.90	0.93	0.93
MSCI ACWI	0.87	0.86	0.52	0.52	0.98	0.97	0.97	0.97
Bloomberg Barclays Multiverse	2.24	0.32	0.28	0.31	-0.01	0.38	0.42	0.46
Bitcoin	0.56	1.33	1.08	0.63	-0.06	0.13	0.20	0.19

	Beta				Jensen Alpha			
	1y	3y	5y	si	1y	3y	5y	si
Base Portfolio	1	1	1	1	0	0	0	0
1% Bitcoin Portfolio	0.99	1.03	1.03	1.02	1.6%	1.8%	1.3%	1.0%
2% Bitcoin Portfolio	0.97	1.05	1.05	1.05	3.1%	3.6%	2.5%	2.0%
3% Bitcoin Portfolio	0.96	1.08	1.08	1.07	4.6%	5.4%	3.8%	2.9%
MSCI ACWI	1.69	1.52	1.51	1.49	-5.5%	-0.2%	-0.4%	-0.4%
Bloomberg Barclays Multiverse	0.00	0.22	0.25	0.27	7.1%	-0.1%	0.2%	0.2%
Bitcoin	-0.70	1.83	2.27	2.12	49.9%	122.1%	82.4%	43.9%

"si": since simulation inception, 31 December 2013. Correlation, Beta and Jensen's Alpha use the Base Portfolio as the benchmark.

Source: WisdomTree, Bloomberg. From 31 December 2013 to 31 October 2019. ***You cannot invest directly in an index. May include backtested data. Historical performance is not an indication of future performance and any investments may go down in value.***

It is evident that Bitcoin's higher performance has been accompanied by higher volatility over the period. On the performance side, if we look at the whole period, a 1% allocation to Bitcoin would have led to a 1.1% annusalised outperformance for the Bitcoin Portfolio, while a 3% allocation would have increased annualised return from 5.1% to 8.3%.

Volatility is also increased as more weight is allocated to Bitcoin, again quite intuitive. But Bitcoin tends to show a low correlation to the equity and fixed income buckets of the portfolio. Adding it to the portfolio did not increase risk as dramatically as it did for returns. The volatility of the 1% Bitcoin portfolio is marginally higher than that of the Base Portfolio, while the 3% Bitcoin Portfolio adds only 1.1% of volatility compared to the Base Portfolio.

FIGURE 6: BITCOIN SHOWS A VERY LOW CORRELATION TO TRADITIONAL ASSETS

	Base Portfolio	1% Bitcoin Portfolio	2% Bitcoin Portfolio	3% Bitcoin Portfolio	MSCI ACWI	Bloomberg Barclays Multiverse	Bitcoin
Base Portfolio	1.00						
1% Bitcoin Portfolio	0.99	1.00					
2% Bitcoin Portfolio	0.97	0.99	1.00				
3% Bitcoin Portfolio	0.93	0.97	0.99	1.00			
MSCI ACWI	0.97	0.96	0.94	0.90	1.00		
Bloomberg Barclays Multiverse	0.46	0.47	0.47	0.46	0.25	1.00	
Bitcoin	0.19	0.31	0.42	0.51	0.16	0.17	1.00

Based on monthly returns.

Source: WisdomTree, Bloomberg. From 31 December 2013 to 31 October 2019. ***You cannot invest directly in an index. May include backtested data. Historical performance is not an indication of future performance and any investments may go down in value.***

The bottom line is that adding Bitcoin to the portfolio would have improved the risk profile of the portfolio. However, investors tied to benchmarks might be cautious of the effect that bitcoin's addition has on the tracking error of their portfolio. In order to address their concerns, we use the Base Portfolio as the benchmark and look at the tracking error of the Bitcoin Portfolios. Allocating small percentages to Bitcoin allows to contain tracking error within a relatively contained range. Over the whole period, the 1% Bitcoin portfolio shows a 1.0% tracking error, while the 3% Bitcoin Portfolio reaches 3.1%.

FIGURE 7: TRACKING ERROR REMAINS RELATIVELY CONTAINED IN THE BITCOIN PORTFOLIOS

	Excess Return				Tracking Error				Information Ratio			
	1y	3y	5y	si	1y	3y	5y	si	1y	3y	5y	si
Base Portfolio	0%	0%	0%	0%	0%	0%	0%	0%	0.0%	0.0%	0.0%	0.0%
1% Bitcoin Portfolio	1.4%	2.0%	1.4%	1.1%	1.1%	1.3%	1.1%	1.0%	1.30	1.53	1.29	1.05
2% Bitcoin Portfolio	2.9%	4.0%	2.8%	2.2%	2.2%	2.6%	2.1%	2.1%	1.30	1.54	1.30	1.05
3% Bitcoin Portfolio	4.2%	5.9%	4.1%	3.2%	3.3%	3.8%	3.2%	3.1%	1.30	1.54	1.30	1.04
MSCI ACWI	0.9%	3.2%	1.8%	1.7%	5.2%	4.6%	4.7%	4.5%	0.17	0.70	0.38	0.38
Bloomberg Barclays Multiverse	-2.2%	-5.2%	-3.0%	-2.9%	7.5%	6.8%	7.0%	6.7%	-0.29	-0.75	-0.43	-0.43
Bitcoin	34.1%	127.6%	87.8%	48.6%	78.8%	100.4%	84.0%	83.1%	0.43	1.27	1.04	0.59

"si": since simulation inception, 31 December 2013. All figures are annualised.

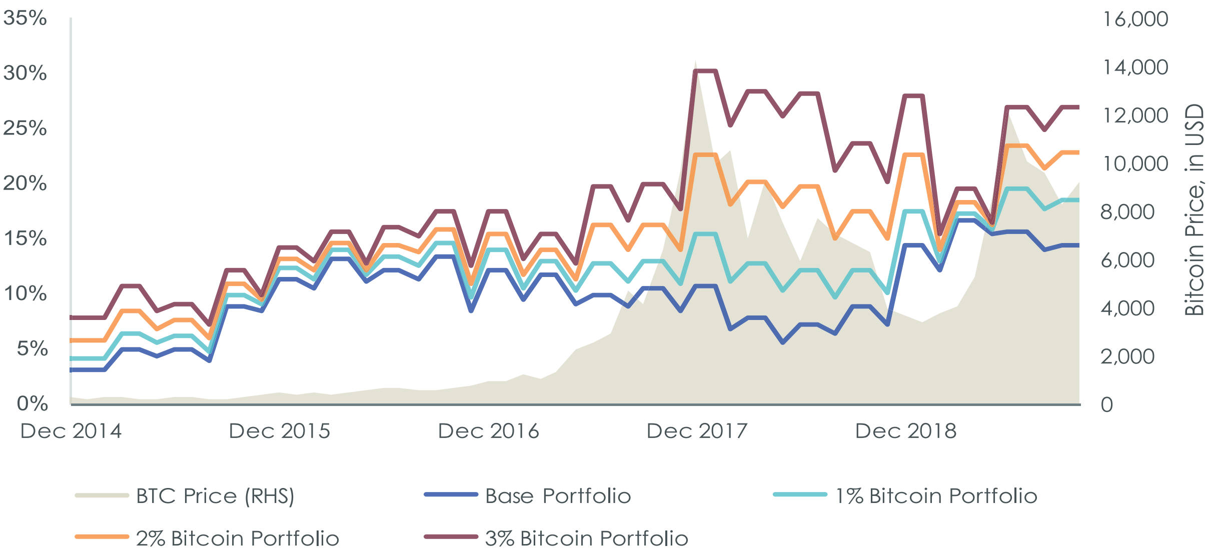
Source: WisdomTree, Bloomberg. From 31 December 2013 to 31 October 2019. ***You cannot invest directly in an index. May include backtested data. Historical performance is not an indication of future performance and any investments may go down in value.***

WHAT ABOUT TURNOVER?

Given the rapid swings in Bitcoin's value, turnover might be a concern as investors rebalance back the constant mix portfolio to its target weight. Looking at the backtest, the conclusions are somewhat similar to what we have seen in the risk and return section: a 1% allocation does not materially affect the portfolio, while a 3% tends to get more aggressive.

Figure 8 looks at the trailing 12-month turnover. Even in periods when Bitcoin price trajectory is quite volatile, the 1% Bitcoin Portfolio's turnover is not more than roughly 5% superior to that of the base Portfolio. On the other hand, the 3% allocation can more than double the turnover over the course of a year. But this needs to be weighed against the 3.2% annualised outperformance it brought to the portfolio.

FIGURE 8: 1% BITCOIN PORTFOLIO TURNOVER RELATILVELY IN LINE WITH BASE PORTFOLIO



Source: WisdomTree, Bloomberg. From 31 December 2013 to 31 October 2019. ***You cannot invest directly in an index. May include backtested data. Historical performance is not an indication of future performance and any investments may go down in value.***

Consequently, a small allocation to Bitcoin in a portfolio would not incur a massive increase in transactions costs. Furthermore, over most of the period, even a 3% allocation to Bitcoin does not lead to a significant increase in turnover. Turnover does increase significantly when Bitcoin shows an exponential rise in price. In those periods, the performance increment from the Bitcoin position would generally dwarf the increase in transaction cost.

In light of this analysis, we believe it might be valuable for an investor to consider the role Bitcoin could have in their portfolios:

- Bitcoin revealed a low correlation to traditional assets.
- A small allocation to Bitcoin in a portfolio increased the return quite significantly, while the increase in risk was limited.
- This resulted in a meaningful improvement in the risk-adjusted profile of the portfolio.

Given the wide oscillations experienced by cryptocurrency markets, a strict buy-and-hold strategy is probably not the right approach for most investors:

- Bitcoin tends to experience sharp price fluctuations. Such market conditions are generally favourable to strategies that sell winners and buy losers, such as a constant mix strategy.
- A systematic approach to profit-taking is beneficial to reallocate gains from the Bitcoin position to the lower risk buckets of the portfolio.
- It also limits the risk that could come from an unwarranted increase in Bitcoin's weight in the portfolio

APPENDIX

What time period?

Choosing a time period is delicate as the choice of a starting date is generally an arbitrary decision that can have a tremendous impact on the analysis. One needs to assess the tradability of the underlying universe to determine which investments can be included in the backtest at any point in time for the results to be representative of what might actually have happened, and of what could be lying ahead. This comes down to finding a balance between the need for a relatively long history, and intellectual honesty.

We chose to start the initial simulation at the end of 2013 for several reasons. First, we believe the data available prior to that period is representative of a very early take-off stage, which characteristics are very unlikely to represent the behaviour of the asset class going forward.

As shown in **Figure 9**, Bitcoin's price went from $0.08 (first available price in the data source used here) to $746.89, which represents a 933,512.5% return. An analysis of that period would be interesting for descriptive purposes, but probably not for inferring future expectations. Furthermore, liquidity was low and the asset relatively difficult to trade, prompting us to discard that period.

FIGURE 9: EARLY PRICE ACTION WAS PHENOMENAL, BUT THE ASSET NOT EASILY TRADABLE

Source: WisdomTree, Bloomberg. From 19 July 2010 to 31 December 2013. ***You cannot invest directly in an index. May include backtested data. Historical performance is not an indication of future performance and any investments may go down in value.***

Secondly, Bitcoin started to get more coverage in the mainstream media in 2013 as the price rose aggressively during that year. Consequently, we can assume that an investor discovering Bitcoin at that time would have had time to learn about the asset class during the course of the year and invest for 2014.

Finally, this date is coincidentally is also the start of what is sometimes referred to as the First Crypto Winter (although it was not the first occurrence of a major price crash), that basically went on from the end of 2013 to the end of Q3 2015. Starting simulations here allow to show what could be considered a worst-case scenario for an investor, with a -75.5% fall between the start the simulation to the $183.07 low on 14 January 2015.

FIGURE 10: SIMULATION STARTS WITH THE "FIRST CRYPTO WINTER"

Source: WisdomTree, Bloomberg. From 01 November 2013 to 31 December 2016. ***You cannot invest directly in an index. May include backtested data. Historical performance is not an indication of future performance and any investments may go down in value.***

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